

(19)



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(11)

**EP 1 051 345 B1**

(12)

**EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention  
of the grant of the patent:  
01.10.2003 Bulletin 2003/40

(51) Int Cl.7: **B65H 35/02, B65H 45/28,  
B65H 37/04**

(21) Application number: 98962461.4

(86) International application number:  
**PCT/FI98/01022**

(22) Date of filing: 23.12.1998

(87) International publication number:  
**WO 99/035073 (15.07.1999 Gazette 1999/28)**

(54) **METHOD OF PACKAGING A WEB**

**VERFAHREN ZUM VERPACKEN EINER BAHN**

**PROCEDE D'EMBALLAGE D'UNE BANDE CONTINUE**

(84) Designated Contracting States:  
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE**

• NIEMI, Tapio  
FIN-48400 Kotka (FI)  
• MÄKINEN, Jarmo  
FIN-48710 Karhula (FI)

(30) Priority: 02.01.1998 FI 980010  
14.10.1998 FI 982230

(74) Representative: **HOFFMANN - EITLE**  
**Patent- und Rechtsanwälte**  
**Arabellastrasse 4**  
**81925 München (DE)**

(43) Date of publication of application:  
15.11.2000 Bulletin 2000/46

(73) Proprietor: **BKI Holding Corporation**  
**Wilmington, DE 19801 (US)**

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(72) Inventors:  
• **HYVÄRINEN, Paavo**  
**FIN-48400 Kotka (FI)**

**EP 1 051 345 B1**

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1

EP 1 051 345 B1

2

**Description**

[0001] The invention relates to a method of packaging a web.

[0002] Webs intended for sanitary products are typically made from natural fibers, such as wood fibers, and synthetic fibers or mixtures thereof, by binding the web by binders or bonding fibers. All web production methods are feasible, such as different wet and dry methods, including what is known as dry web forming and carding. By a web machine, such as a dry web machine, the web is typically reeled to what is known as a jumbo reel, which is then longitudinally slit into narrower reels of a desired width. During production, these narrower reels are distributed and fed to a preparing machine. However, the width of the web used in the preparing machine may be as narrow as 30 mm, and reeled as a round reel it does not hold together very well, and, most importantly, contains a comparatively small amount of web material. This is why reels have to be changed very often, even at intervals of a few minutes, when web is fed to the preparing machine. It is uneconomical to transport web either as a jumbo reel or as narrower reels formed by slitting, since relatively much waste space is bound to remain between the round reels.

[0003] EP-A-0 383 501 discloses a web supply system comprising a plurality of cassettes each containing a fan folded web. The trailing end of the web of each cassette (except the last) is joined to the leading end of the web of the next adjacent cassette so that the web from all the cassettes can be supplied as a continuous web.

**SUMMARY OF THE INVENTION**

[0004] It is an object of the present invention to produce a novel method for packaging a web, which avoids the above problems mainly relating to the use of round web reels in preparing machines and the transport of same to preparing machines. This is achieved by the method of packaging a web according to the invention as defined in claim 1, in which method a web is slit into two or more narrower webs which are folded into superimposed layers. The method is characterized by comprising the steps of directing the webs to a nip formed by two rotating reels and by inducing the webs, held against the surfaces of the first and the second reel, to move with the reel alternately the length of a predetermined rotational angle to provide folding, and joining the ends of the webs together so that the webs form a continuous whole whose length corresponds to the combined length of the webs. Thus the web material forms a single continuous whole which can also be distributed as a continuous web during further processing. Webs obtained by slitting from a wide web can be joined together at their ends in principle in two alternative ways, either by joining the forward end of a web and the forward end of an adjacent web together or by joining to-

gether the ends of adjacent webs in pairs. In the former case, the web is continuously distributed in the same direction and in the latter, alternately in opposite directions. In practice, this manner of distributing may affect the operation of the further processing device of the web.

[0005] The package produced by the method according to the invention comprises two or more side-by-side stacks of superimposed web layers formed by folding the web, the ends of the webs in the stacks being joined together so that the webs form a continuous whole whose length corresponds to the combined length of the webs.

[0006] The package preferably comprises around the stacks a solid outer casing made from e.g. corrugated cardboard or plastic film.

[0007] When the method of the invention is used, the web material placed in a substantially parallelepiped-shaped package constitutes one continuous web which can be distributed as a continuous whole by a preparing machine. This avoids the need for frequent reel changes. The package is generally parallelepiped-shaped, completely filled by the material to be packaged, allowing a very high packaging density during web transport.

[0008] The forward and tail ends of the joined continuous web in the package preferably extend to the outside of the outer casing of the package to allow webs in several packages to be easily combined to a single still longer whole e.g. in view of distributing by a preparing machine.

**LIST OF DRAWINGS**

[0009] In the following the method of the invention will be described in greater detail with reference to the attached drawing, in which

Figure 1 schematically shows a first exemplary embodiment of an equipment utilizing the method of the invention,

Figure 2 schematically shows a second exemplary embodiment of an equipment utilizing the method of the invention, and

Figure 3 schematically shows the operational principles of the method of the invention.

**DETAILED DESCRIPTION OF THE INVENTION**

[0010] Figure 1 schematically shows an exemplary embodiment of a packaging equipment utilizing the method of the invention. A web 1, typically made e.g. by dry forming from natural fibres, such as wood fibre, and synthetic fibres or mixtures thereof by binding the web by a binder or binding fibres, is led to a packaging equipment employing the method of the invention. The equipment shown in Figure 1 comprises folding reels 3, the reels being placed in a vertical position. As will be described in more detail in association with Figure 3, while

3

EP 1 051 345 B1

4

folding it, the reels pull the web 1 into a packing box 7. Before the web 1 enters the folding reels, it is slit by slitter blades 8 into webs 2a to 2e of a desired width. The widths of the webs 2a to 2e typically vary between 200 and 30 mm, and hence the number of webs varies correspondingly with the web width used and the desired web width. Such webs are typically used in the production of sanitary products, such as sanitary napkins, panty liners, diapers etc.

[0011] The webs 2a to 2e are directed to a nip formed by two rotating reels 3a and 3b, and induced, held alternately against the surfaces of the first and second reel, to shift with the reel the length of a predetermined rotational angle to provide folding, as is shown in Figure 3. The folding reels 3, comprising two folding reels 3a and 3b rotating in opposite directions, simultaneously pulls the web 1 forward. The webs 2a to 2e are held against the surface of the reel by mechanical engagement of the web by means 9 and 10 disposed on the surface of the reel and/or by suction using underpressure, the surface of the reel being perforated in the angle area covering at least part of the surface of the reel.

[0012] The ends of the slit webs must be joined together for the slit webs to form a continuous whole. In principle, two alternative methods can be used to join the webs. The first method involves joining the forward/tail end of the outermost web to the forward/tail end of the adjacent web, whose forward/tail end is joined to the forward/tail end of the next web, the process continuing until all webs are joined to a continuous whole whose length corresponds to the combined length of the webs. In this method the webs are not joined until after folding, and therefore they cannot be folded directly into the package, such as a cardboard box or a plastic bag. This method allows the folded continuous whole formed by the joined web stacks to be placed in the package only after the ends are joined. An advantage of this method is that the distributing direction remains the same throughout the distributing of the web from the package. If the stacks formed by the webs 2a to 2e are side by side during distributing, the outermost web can be distributed first from top to bottom, and since the tail end of the web is joined to the forward end of the adjacent web, said adjacent web can also be distributed from top to bottom.

[0013] An alternative joining method, which is suitable for folding directly into a package, as shown by Figures 1 and 2, is to join together the forward and tail ends of the webs 2a to 2e in pairs, the pairs being formed at one end of the webs starting from the outermost web 2a, and at the other ends of the webs the pairs are formed starting from the next to the outermost web 2b. In this case in the embodiment of e.g. Figure 1, the pairs of forward ends of the webs are formed from the webs 2a and 2b, and the webs 2c and 2d. These ends are joined together preferably before folding, so that these ends no longer have to be dug up from the bottom of the package after the webs have been folded directly into the package,

which would be possible e.g. via a packing box bottom that could be opened. When starting the folding into the packing box 7, the forward end of the web 2a, which can be thought to form the last portion of the continuous web to be formed to the package, i.e. the end remaining at the bottom, can be left visible if desired, to allow joining it to one end of a continuous web disposed in another similar package.

[0014] After the forward ends of the webs have been joined, the folding reels 3 start to pull the web into the packing box simultaneously folding it into superimposed layers, denoted by reference number 4 in Figure 3. By correct dimensioning of the reels 3a and 3b of the folding reels 3 and the packing box 7, the box can be filled by precisely superimposed layers of folded web 1. Once the packing box 7 is filled, the web 1 is cut and the free tail ends of the webs 2a to 2e are joined together in pairs, the pairs being formed starting from the second outermost web 2b. The webs 2b and 2c are consequently joined together, and similarly the webs 2d and 2e are joined together at their tail ends. In this way several side-by-side stacks, denoted by reference number 5 in Figure 3, are formed in the packing box 7 by folded superimposed web layers 4, the forward and tail ends of the webs in the stacks being joined together in pairs so as to form a continuous whole whose length corresponds to the combined length of the webs 2a to 2e. When the package is being closed, the free end of the web 2a, which can be thought to form the first part of the continuous web to be formed into the package, i.e. the end on top of the package, is left visible to enable one end of a web in a similar package to be joined to it.

[0015] When the package of the invention, i.e. the packing box 7 in the case of Figures 1 and 2, is conveyed to a preparing machine, it will be possible to distribute the webs from the package as a single continuous whole. In practice, as the box was packed via side 7b, this is accomplished by opening side 7a of the box 7. By grabbing the free end of the web 2a, the entire web 2a can be distributed from the end 7. As described above, its tail end is joined to the tail end of the web 2b, and consequently the web 2b starts to distribute from the package as the end of the web 2a is reached. In this way all webs 2a to 2e are distributed from the package as a continuous whole. When packing boxes 7 are placed in succession on a conveyor and the visible forward end of a web therein is joined to the visible tail end of the web in the preceding packing box, and, similarly, the visible tail end is joined to the visible forward end of the web in the next packing box, several packages can be chained on the conveyor, and the preparing machine does not have to be stopped even when the web starts to distribute from a new package.

[0016] Figure 2 shows a second exemplary embodiment of an equipment implementing the packaging method of the invention, with the folding reels placed in a vertical position. Other parts of the equipment and its structure and operation completely correspond to those

3

5

EP 1 051 345 B1

6

of the equipment shown in Figure 1. It is obvious that when studying the folding procedure of Figure 3 in particular, that the equipment of Figure 2 can easily fold the webs in the desired manner into adjacent stacks into a packing box 7. The equipment shown in Figure 1 also operates in the same manner, and this is because the material of the web 1 is typically very light, the effect of gravity thereon remaining very slight, particularly considering that the travel speed of the web 1 is assumed to be up to 400 meters per minute. At such a speed the web 1 is folded into the box without problems with the folding reels 3a and 3b pushing it into the box. If the web width is e.g. 38 mm, 15,000 meters of web, for example, can be packaged into one packing box.

[0017] In Figure 2, the packing box 7 is placed on a lifting table 8 facilitating the joining together of the web ends, as it will be possible to lower the packing box to the side of the folding reels 3, whereby it is easier to join together the web ends at their forward and tail ends in the desired manner. A similar manner of changing the distance between the folding reels 3 and the packing box 7 may naturally also be applied to the embodiment of Figure 1.

[0018] Figure 3 schematically shows how the web 1 is folded in the manner of the invention. The web 1 is folded by means of the reels 3a and 3b by rotating the reels in opposite directions so that they pull the web 1. Mechanical grippers 9, to which the web 1 adheres by the action of a blade-like or strip-like projection 10, are placed at the peripheries of the diametrically placed reels 3a and 3b. Accordingly, the blade or metal strip 10 in one reel pushes the web between two spring-loaded gripper parts 9 to make the web adhere to said gripper 9. As the reels rotate forward, the reel moves the web along a path defined by the periphery of the reel to a position in which the web 1 is to be detached from the reel. In Figure 3, the web is attached to the gripper 9 of the reel 3a and is in a position where the web 1 must still be fastened to the gripper 9.

[0019] Very soon after the position shown in Figure 3, the reel 3a rotates to a position in which the web 1 is to be detached from the gripper 9. This can be accomplished by means of e.g. an eccentric arrangement, which opens the spring-loaded gripper 9 detaching the web. At the same moment, blades 10 on opposite sides of the reels and the gripper 9 of the second reel have gripped the web 1. In this manner the second reel 3b in turn moves the web to its side at a desired distance. Thus the web 1 can be folded in the manner shown in Figure 3 into superimposed layers 4, which form a stack 5. Let it be pointed out that the operation of the gripper 9 can be intensified by directing to the web a suction via suction openings arranged in the reel in that portion of the reel in which the web is to adhere to the reel. In fact, if desired, the entire gripper could be replaced by such a suction zone provided the properties of the web 1 allow this. On the other hand, the grippers outlined in Figure 3 achieve this reliably enough.

[0020] The ends of the webs 2a to 2c can be joined together in many alternative ways depending partly on the properties of the web, such as tear resistance, and future use of the web, e.g. if the joint can be left in the finished product or should a product containing a joint be rejected. Depending on these conditions, the webs can be joined by: sewing, taping, gluing, needling, hot sealing, ultrasound sealing, stapling or the like.

[0021] As shown above in Figures 1 and 2, the web 1 is folded into a packing box 7. However, it is feasible that the package is not such a box 7, but e.g. merely a plastic film. It is feasible that the web 1 is folded into a bag made of plastic film and bearing against a suitable holder. As to the web stacks which are result of folding the web, it is not very relevant what kind of outer casing supports them, as long as it allows the webs to be folded and distributed in the manner described, and the web stacks to be conveyed to the preparing machine. Similarly, if the web is not placed in the package until after folding and joining of the ends, the outer cover of the package can be either a box or a plastic film, which is able to hold the stacks together suitably squeezed to achieve an optimal packaging density.

[0022] The method of the invention for packaging a web have been described above only by means of some exemplary embodiments and it is to be understood that the described solutions can be varied to some extent without deviating from the scope defined by the attached claims.

#### Claims

##### 1. A method of packaging a web comprising:

slitting a web to form a slit web of two or more narrower webs; and, characterized by:  
directing the slit web to a nip formed by first and second rotating reels;  
inducing the slit web to move with the first and second rotating reels a length of a predetermined rotational angle to provide folding of the two or more narrower webs of the slit web into superimposed layers by holding the two or more narrower webs alternatively against surfaces of the first and second rotating reels to form adjacent stacks, the narrower web of each stack having a first end and a second end; and  
joining the ends of the two or more narrower webs together so that the two or more narrower webs form a continuous whole whose length corresponds to a combined length of the two or more narrower webs.

##### 2. The method of claim 1, wherein the step of joining the ends of the two or more narrower webs comprises joining a first end of an outermost stack to a second end of an adjacent stack, whose first end is

7

EP 1 051 345 B1

8

joined to a second end of a next adjacent stack, the joining process continuing until all of the webs are joined to form a continuous whole whose length corresponds to the combined length of the two or more narrower webs.

3. The method of claim 1, wherein the step of joining the ends of the two or more narrow webs comprises joining the first ends of the two or more stacks in pairs, the pairs being formed at one end of the stacks beginning with an outermost stack, and at the other end the pairs being formed starting from the stack next to the outermost stack, the webs of the stacks forming a continuous whole whose length corresponds to the combined length of the two or more narrower webs.
4. The method of claim 1, wherein the step of holding the two or more narrower webs alternatively against surfaces of the first and second rotating reels comprises holding the webs against the surfaces of said reels by mechanical engagement of the web by means disposed on the surfaces of said reels.
5. The method of claim 4, wherein the means comprises at least one mechanical gripper and at least one projection extending outwardly from a periphery of the first and second rotating reels.
6. The method of claim 1, wherein the step of holding the two or more narrower webs comprises holding the webs against the surfaces of the first and second rotating reels by mechanical engagement of the web by suction using underpressure.
7. The method of claim 1, wherein the ends of the two or more narrower webs are joined by a process selected from the group consisting of sewing, taping, gluing, needling, hot sealing, ultrasound sealing, and stapling.

#### Patentansprüche

1. Verfahren zum Verpacken einer Bahn, mit:

Schlitzen einer Bahn zur Ausbildung einer geschlitzten Bahn aus zwei oder mehr schmälere Bahnen; und

Zuführen der geschlitzten Bahn zu einer Einquetschstelle, die durch eine erste und eine zweite, sich drehende Trommel gebildet wird;

Veranlassen, dass sich die geschlitzte Bahn mit der ersten und der zweiten drehenden Trommel um eine Länge eines vorbestimmten Drehwinkels bewegt, um eine Faltung der zwei oder

mehr schmälere Bahnen der geschlitzten Bahn zu einander überlagerten Schichten heranzurufen, durch Halten der zwei oder mehr schmälere Bahnen alternativ gegen Oberflächen der ersten und der zweiten drehenden Trommeln, um benachbarte Stapel auszubilden, wobei die schmälere Bahn jedes Stapels ein erstes Ende und ein zweites Ende aufweist; und

Verbinden der Enden der zwei oder mehr schmälere Bahnen miteinander, so dass die zwei oder mehr schmälere Bahnen ein zusammenhängendes Ganzes bilden, dessen Länge der vereinigten Länge der zwei oder mehr schmälere Bahnen entspricht.

2. Verfahren nach Anspruch 1, bei welchem der Schritt der Verbindung der Enden der zwei oder mehr schmälere Bahnen das Verbinden eines ersten Endes eines äußersten Stapels mit einem zweiten Ende eines benachbarten Stapels umfasst, dessen erstes Ende mit einem zweiten Ende eines nächsten, benachbarten Stapels verbunden wird, und der Verbindungsvorgang weitergeht, bis sämtliche Bahnen verbunden sind, um ein zusammenhängendes Ganzes zu bilden, dessen Länge der vereinigten Länge der zwei oder mehr schmälere Bahnen entspricht.
3. Verfahren nach Anspruch 1, bei welchem der Schritt der Verbindung der Enden der zwei oder mehr schmälere Bahnen das Verbinden der ersten Enden der zwei oder mehr Stapel paarweise umfasst, die Paare an einem Ende der Stapel ausgebildet werden, beginnend mit einem äußersten Stapel, und an dem anderen Ende die Paare beginnend bei dem am nächsten an dem äußersten Stapel liegenden Stapel ausgebildet werden, und die Bahnen der Stapel ein durchgehendes Ganzes bilden, dessen Gesamtlänge der vereinigten Länge der zwei oder mehr schmälere Bahnen entspricht.
4. Verfahren nach Anspruch 1, bei welchem der Schritt des Haltens der zwei oder mehr schmälere Bahnen alternativ gegen Oberflächen der ersten und zweiten drehenden Trommeln das Halten der Bahnen gegen die Oberflächen der Trommeln durch mechanischen Eingriff der Bahn mit einer Vorrichtung umfasst, die auf den Oberflächen der Bahnen angeordnet ist.
5. Verfahren nach Anspruch 4, bei welchem die Vorrichtung zumindest einen Vorsprung aufweist, der sich von einem Umfang der ersten und zweiten drehenden Trommel nach außen erstreckt.

9

EP 1 051 345 B1

10

6. Verfahren nach Anspruch 1, bei welchem der Schritt des Haltens der zwei oder mehr schmälere Bahnen das Halten der Bahnen gegen die Oberflächen der ersten und zweiten drehenden Trommeln durch mechanischen Eingriff der Bahn mittels Saugwirkung unter Verwendung von Unterdruck umfasst.
7. Verfahren nach Anspruch 1, bei welchem die Enden der zwei oder mehr schmälere Bahnen durch einen Vorgang verbunden werden, der aus der Gruppe ausgewählt ist, die besteht aus Nähen, Bandagieren, Kleben, Nadeln, Heißsiegeln, Ultraschallsiegeln, und Heften.

#### Revendications

1. Procédé de conditionnement d'une bande comprenant :

la refente d'une bande pour former une bande refendue constituée de deux ou plusieurs bandes plus étroites, et caractérisé par les étapes suivantes :

orienter la bande refendue vers un pincement formé par des première et seconde bobines en rotation, amener la bande refendue à se déplacer avec les première et seconde bobines en rotation d'une longueur correspondant à un angle de rotation prédéterminé afin de permettre le pliage des deux ou plusieurs bandes plus étroites de la bande refendue en couches superposées en retenant les deux ou plusieurs bandes plus étroites alternativement contre les surfaces des première et seconde bobines en rotation afin de former des piles adjacentes, la bande plus étroite de chaque pile ayant une première extrémité et une seconde extrémité, et joindre ensemble les extrémités des deux ou plusieurs bandes plus étroites de manière à ce que les deux ou plusieurs bandes plus étroites forment un tout continu dont la longueur correspond à une longueur combinée des deux ou plusieurs bandes plus étroites.

2. Procédé selon la revendication 1, dans lequel l'étape de jonction des extrémités des deux ou plusieurs bandes plus étroites comprend la jonction d'une première extrémité d'une pile la plus à l'extérieur à une seconde extrémité d'une pile adjacente, dont la première extrémité est jointe à une seconde extrémité d'une pile adjacente suivante, le processus de jonction se poursuivant jusqu'à ce que toutes les

bandes soient jointes pour former un tout continu dont la longueur correspond à la longueur combinée des deux ou plusieurs bandes plus étroites.

3. Procédé selon la revendication 1, dans lequel l'étape consistant à joindre les extrémités des deux ou plusieurs bandes plus étroites comprend la jonction des premières extrémités des deux ou plusieurs piles par paires, les paires étant formées à une extrémité des piles en commençant par une pile la plus à l'extérieur, et à l'autre extrémité des paires étant formées en débutant à partir de la pile à côté de la pile la plus à l'extérieur, les bandes des piles formant un tout continu dont la longueur correspond à la longueur combinée des deux ou plusieurs bandes plus étroites.

4. Procédé selon la revendication 1, dans lequel l'étape consistant à retenir les deux ou plusieurs bandes plus étroites alternativement contre les surfaces des première et seconde bobines en rotation comprend la rétention des bandes contre les surfaces desdites bobines par une saisie mécanique de la bande grâce à un moyen disposé sur les surfaces desdites bobines.

5. Procédé selon la revendication 4, dans lequel le moyen comprend au moins une pince mécanique et au moins une protubérance s'étendant vers l'extérieur depuis une périphérie des première et seconde bobines en rotation.

6. Procédé selon la revendication 1, dans lequel l'étape consistant à retenir les deux ou plusieurs bandes plus étroites comprend la rétention des bandes contre les surfaces des première et seconde bobines en rotation par une saisie mécanique de la bande par aspiration en utilisant une dépression.

7. Procédé selon la revendication 1, dans lequel les extrémités des deux ou plusieurs bandes plus étroites sont jointes grâce à un processus choisi parmi le groupe constitué d'une couture, d'une fixation par ruban adhésif, d'un collage, d'une piqure, d'un thermoscellage, d'un scellage à ultrasons et d'un agrafage.

EP 1 051 345 B1

Fig. 1

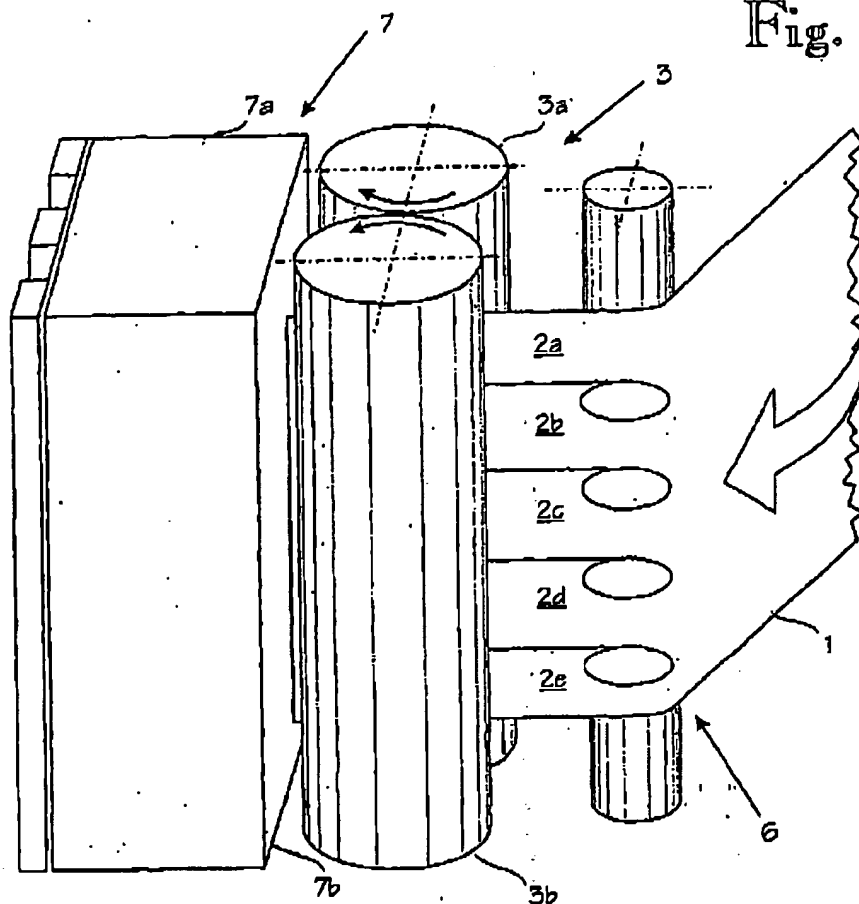
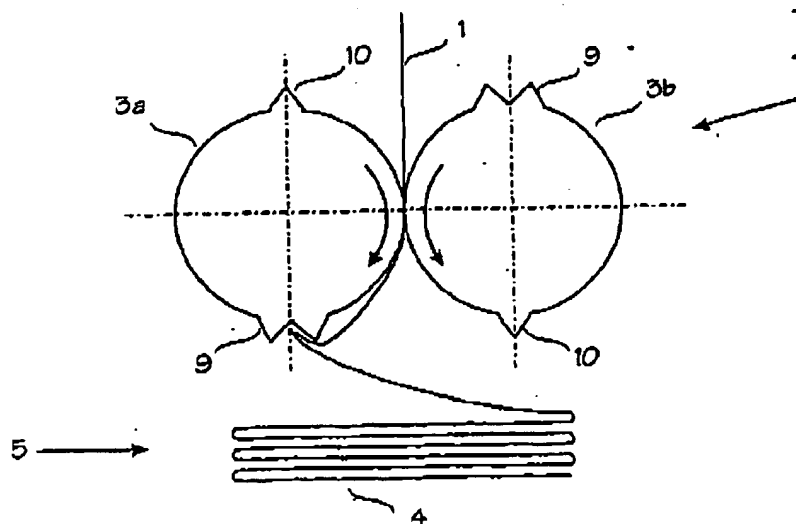
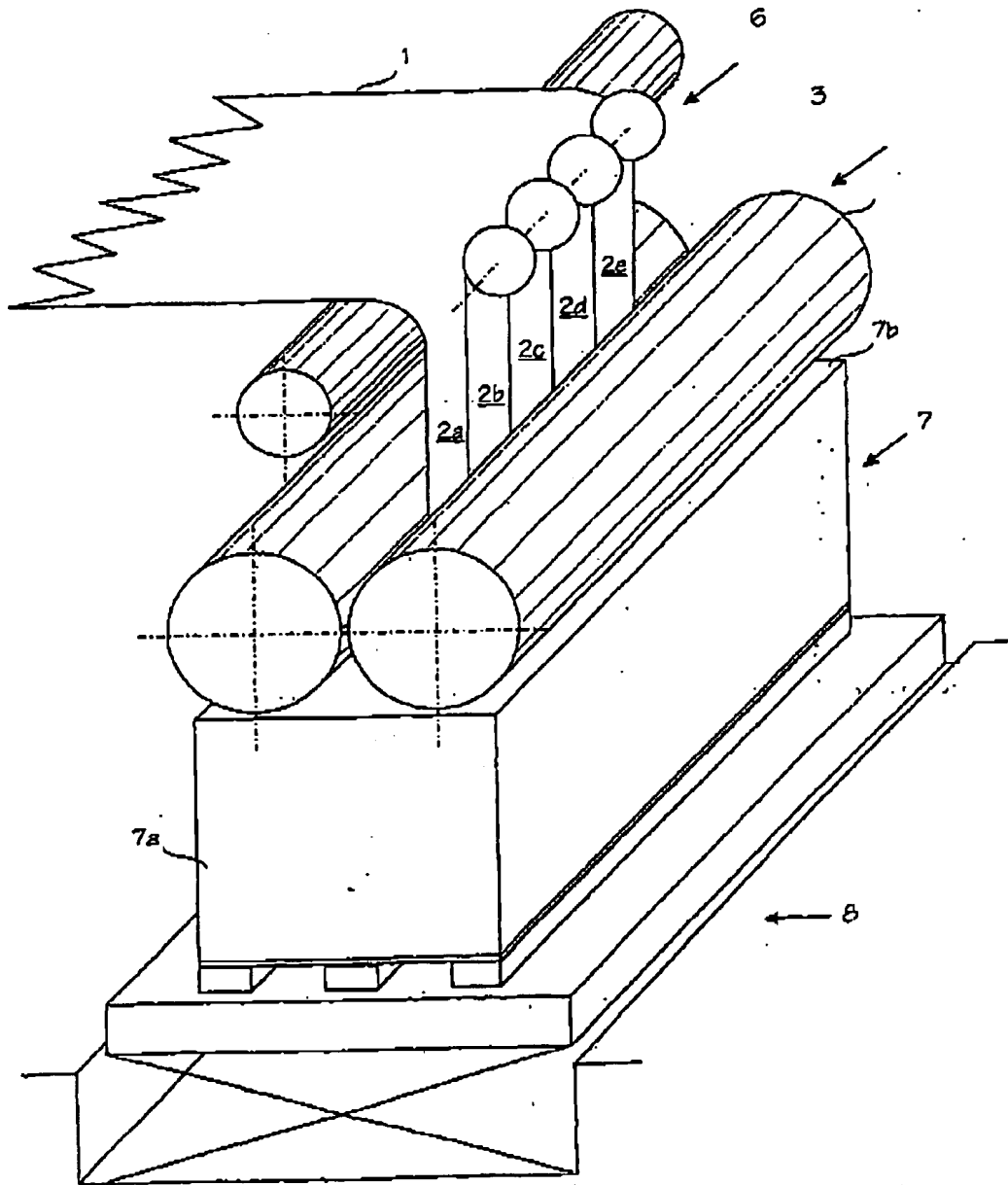


Fig. 3



EP 1 051 345 B1

Fig. 2





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